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## EUROPEAN PATENT APPLICATION

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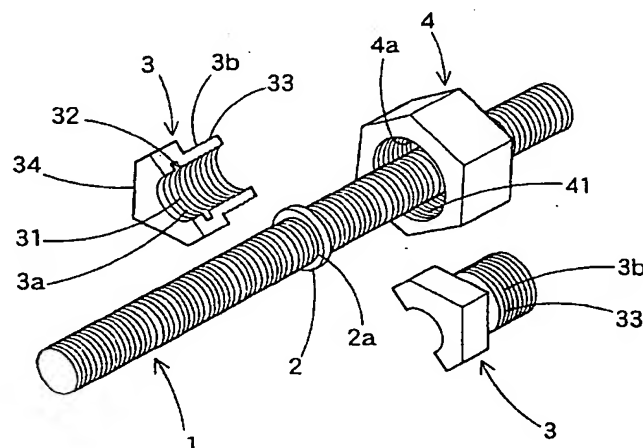
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### (54) Lock nut device

(57) The lock nut device is constituted by a nut setting member fitted loosely to an outer circumferential part of a screw shaft such as a bolt; split nuts (3,3) divided in two in axial direction and fitted so as to envelope the outside of the nut setting member fitted to the screw shaft, the split nuts having an inner screw and a locking groove into which the nut setting member (2) is to be fitted at an inner surface and having an outer screw in taper shape at an outer circumferential part; and a lock nut (4) having an inner screw (4a) to be threadedly engaged with the outer screw in taper shape of the split nuts (3,3). In order to fix a nut to a screw shaft such as a bolt (1), the nut setting member (2) is put around the outer circumferential part of the screw shaft and stood

still to a prescribed position. The split nuts (3,3) divided in two are fitted so as to envelope the outer circumference of the screw shaft and the nut setting member (2). The nut setting member is fitted into a locking groove (32) provided at the inner circumference of the split nuts (3,3), and the inner screw (3a,3a) of the split nuts (3,3) is fitted to the thread of the screw shaft. Thus the split nuts (3,3) divided in two are held in the assembled state in one body at a desired position of the outer circumferential part of the screw shaft by the fitting of the locking groove (32) at the inside and the nut setting member (2). In this state, the lock nut (4) is threadedly engaged with the outer circumferential part (3b) of the split nuts (3,3) and is tightened.

Fig. 1



## Description

### Background of the Invention

#### 1. Field of the Invention

[0001] The present invention relates to a lock nut device which is used for various sorts of machines, materials, tools and the like, where a nut to be threadedly engaged with a bolt or a screw shaft is locked.

#### 2. Description of the Prior Art

[0002] In the prior art, as a lock nut device where a nut to be threadedly engaged with a bolt or a screw shaft is locked, a lock nut device using a dividing type nut is proposed in JP-A 9-72327, JP-A 6-280840, JP-U 6-1827 or the like. Also although not a lock nut device, a fastener or the like having a threaded part divided in two is known in United States Patent 5090857, United States Patent 5226678 or the like.

[0003] The device in JP-A 9-72327 has structure that a nut main body has an inner screw and two slits in axial direction and a non-slide surface or an outer screw is provided on a part of a taper outer wall surface of the nut main body, an outside body has a non-slide surface or an inner screw to be fitted to the non-slide surface or threadedly engaged with the outer screw of the nut main body, and the nut main body is grasped utilizing the engagement of the non-slide surface or the inner screw of the outside body with the non-slide surface or the outer screw of the main body, thereby the threaded engagement and grasping state between the screw shaft and the inner screw of the nut main body is secured and the nut main body is locked. However, since the structure of the nut main body is not completely dividing type, there is a problem that the grasping force is limited, or when the nut main body is to be fitted to the screw shaft, the nut main body must be inserted from the end portion of the screw shaft inevitably and can not be fitted from the outside of the screw shaft to any position simply.

[0004] The device in JP-A 6-280840 comprises an outside body of nut-like external shape having an inner wall part of taper shape with diameter decreasing gradually toward one small-diameter opening and having a slit formed in the longitudinal direction at the side of the other large-diameter opening; split nuts divided in two with an outside surface of taper shape corresponding to the inner wall part of taper shape of the outside body having a screw formed on an inside wall surface and having an operation arm projected to be engaged with the slit; and a coil spring for energizing the split nuts toward the inner wall part side of taper shape within the outside body, where the split nuts are pressed into the outside body of nut-like external shape through a mounting ring and the coil spring. However, since the lock nut device is complicated in the structure and the number of parts such as a coil spring, a cover or the like is in-

creased and the operation arm is projected at the split nuts, there is a problem that the machining of the split nuts is difficult.

[0005] Further the device in JP-U 6-1827 has structure that split nuts divided in two are arranged within a case with an inner circumferential surface formed in taper, and a suspension bolt is threadedly engaged with the split nuts. An operation part extending to the outside is projected from each split nut and is fitted to a groove hole bored on the case, and the split nuts are moved in the axial direction of the case and the radius direction by the guide action of the inner circumferential surface in taper shape of the case thereby the suspension bolt is fixed. However, since the case of the device is fixed to the lower surface of the ceiling panel and the suspension bolt is suspended and threadedly engaged there, the application area is limited and there is a problem that the lock nut can not be locked generally at any position of the bolt or the screw shaft.

#### Summary of the Invention

[0006] A lock nut device of the present invention comprises a nut setting member loosely fitted to an outer circumferential part of a screw shaft such as a bolt; split nuts divided in two in axial direction and fitted so as to envelope the outside of the nut setting member fitted to the screw shaft, the split nuts having an inner screw and a locking groove into which the nut setting member is to be fitted at an inner surface and having an outer screw of taper shape at an outer circumferential part; and a lock nut having an inner screw to be threadedly engaged with the outer screw in taper shape of the split nuts.

[0007] In the nut setting member, a simple annular nut setting ring or a C-type ring with a part thereof cut away may be used. Also in the split nuts, a polygonal head in the same shape as that of the lock nut may be provided.

[0008] In order to fix a lock nut to a screw shaft such as a bolt using the lock nut device, first, a nut setting member is put around an outer circumferential part of the screw shaft and then stood still to a desired position.

[0009] Next, split nuts divided in two are fitted to each other so as to envelope the screw shaft and the outer circumference of the nut setting member. Then the nut setting member is fitted into a locking groove provided on the inner circumference of the split nuts, and the inner screw of the split nuts is fitted to the thread of the screw shaft. The two split nuts are held in integrally fitted state at a desired position of the outer circumferential part of the screw shaft by the fitting of the locking groove at the inside of the split nuts and the nut setting member to each other.

[0010] Next, the lock nut is put around the screw shaft and the lock nut is threadedly engaged with the outer screw on the outer circumferential part of the split nuts, and then the split nuts are tightened by turning the lock nut. Then since a gap exists at the fitted portion of the two split nuts and further the outer screw on the outer

circumference of the split nuts is formed in taper surface and also the inner screw of the lock nut corresponds to the shape, the split nuts are tightened and fixed strongly on the screw shaft by turning the lock nut.

[0011] On the other hand, in order to release the lock of the lock nut device, the lock nut is turned in the loosening direction and the tightening of the split nuts is released. If the lock nut is detached from the outer circumference of the split nuts, the split nuts can be easily detached from the outer circumferential part of the screw shaft. Consequently, since the nut setting member fitted loosely to the outer circumference of the screw shaft becomes free, it can be moved to any position along the screw shaft or detached from the screw shaft.

[0012] The lock nut device can be constituted by parts being very small in number, the nut setting member, the split nuts and the lock nut, and the nut can be locked to any position of the screw shaft such as a bolt rapidly and simply. Also even if the split nuts are fastened with rust, they can be easily detached by detaching the lock nut.

[0013] An object of the present invention is to provide a lock nut device which can lock a nut to any position of a screw shaft such as a bolt simply, securely and strongly by the above-mentioned configuration and can be constituted by parts of minimum number.

#### Brief Description of the Drawings

##### [0014]

Fig. 1 is an exploded perspective view of a lock nut device showing an embodiment of the invention;  
Fig. 2 is a sectional view of an assembled lock nut device;  
Fig. 3 is a perspective view of a lock nut device; and  
Fig. 4 is a perspective view of a C-type ring being a nut setting ring.

#### Description of the Preferred Embodiments

[0015] Fig. 1 is an exploded perspective view of a lock nut device showing an embodiment of the present invention, and Fig. 2 is a sectional view of a lock nut device in assembled state. A screw shaft 1 is constituted by a screw part such as a screw shaft or a bolt, to be used for various sorts of machines, materials, tools and the like. A nut setting ring 2 is loosely fitted to an outer circumference of the screw shaft 1, and can be easily moved and stood still at any position.

[0016] Split nuts 3 are constituted in that a nut having a taper thread part is divided in two in axial direction, and at an inner surface 3a of the split nuts 3, an inner screw 31 to be engaged with an outer screw of the screw shaft 1 is provided. Also at the inner surface of both split nuts 3, a locking groove 32 is provided in which the nut setting ring 2 can be inserted. Width of the locking groove 32 is formed nearly the same as that of the nut setting ring 2, and when the nut setting ring 2 is inserted

in the locking groove 32, the nut setting ring 2 can be fitted easily. Depth of the locking groove 32 is formed larger than thickness of the nut setting ring 2.

[0017] Also a hexagonal head 34 is provided at one end of the split nuts 3. Shape of the head 34 is the same as that of a lock nut 4 described later. An outer circumference of a cylindrical part succeeding the head 34 is in taper shape with diameter decreasing toward the end, and an outer screw 33 is formed on an outer circumferential surface 3b of the cylindrical part. Both split nuts 3, 3 divided in two are formed so that when the inner screw 31 is threadedly engaged with and fitted to the outer circumference of the screw shaft 1, a gap 6 is produced between both split nuts 3, 3.

[0018] An inner surface 4a of the lock nut 4 is formed in taper corresponding to the outer circumferential surface 3b of the cylindrical part of the split nuts 3, and the inner surface 4a is provided with an inner screw 41 to be threadedly engaged with the outer screw 33.

[0019] In order to fix a nut to a screw shaft 1 such as a bolt using a lock nut device in the above-mentioned configuration, first, the nut setting ring 2 is put around the outer circumferential part of the screw shaft 1 and then stood still to a prescribed position.

[0020] Next, split nuts 3 divided in two are fitted so as to envelope the outer circumference of the screw shaft 1 and the nut setting ring 2. Then the nut setting ring 2 is fitted into a locking groove 32 provided at the inner circumference of the split nuts 3, and the inner screw 31 of the split nuts 3 is fitted to the thread of screw shaft 1. Thus the split nuts 3 divided in two are held in the assembled state in one body at a desired position of the outer circumferential part of the screw shaft 1 by the fitting of the locking groove 32 at the inside and the nut setting ring 2.

[0021] Next, a lock nut 4 is put around the screw shaft 1 and also threadedly engaged with the outer screw 3b on the outer circumferential part of the split nuts 3, and both split nuts 3 are tightened by turning the lock nut 4. Then a gap 6 exists at a joining portion between the two split nuts 3, and further since the outer screw 3b on the outer circumference of the split nuts 3 is formed in taper surface and the inner screw 4a of the lock nut 4 corresponding to the shape of the outer screw 3b, the split nuts 3 are tightened and fixed strongly on the screw shaft 1 by turning the lock nut 4.

[0022] In order to release the lock of the lock nut device, the lock nut 4 is turned in the loosening direction and the tightening of the split nuts 3 is released. If the lock nut 4 is detached from the outer circumference of the split nuts 3, the split nuts 3 can be easily detached from the outer circumferential part of the screw shaft 1. Thus since the nut setting ring 2 fitted loosely to the outer circumference of the screw shaft 1 becomes free, it can be moved along the screw shaft 1 to any position or detached from the screw shaft 1.

[0023] The lock nut device can be constituted by very small number of parts, the nut setting ring 2, the split

nuts 3 and the lock nut 4, and can lock a nut rapidly and simply to any position of a screw shaft 1 such as a bolt. Even if the split nuts are fastened with rust, the split nuts can be easily detached by detaching the lock nut, and the lock nut device can be conveniently used for various sorts of machines, transporting devices and the like.

[0024] The C-type ring 5 with a part thereof cut away shown in Fig. 4 is used as a nut setting ring, and also a divided-type ring being able to divided into a few-parts can be used.

#### Claims

1. A lock nut device comprising:

(a) a nut setting member fitted loosely to an outer circumferential part of a screw shaft such as a bolt;

(b) split nuts divided in two in axial direction and fitted so as to envelope the outside of said nut setting member fitted to said screw shaft, said split nuts having an inner screw and a locking groove into which said nut setting member is to be fitted at an inner surface and having an outer screw in taper shape at an outer circumferential part; and

(c) a lock nut having an inner screw to be threadedly engaged with the outer screw in taper shape of said split nuts.

2. A lock nut device as set forth in claim 1, wherein as the nut setting member, an annular nut setting ring is used.

3. A lock nut device as set forth in claim 1, wherein as the nut setting member, a C-type ring with a part thereof cut away is used.

4. A lock nut device as set forth in claim 1, wherein in the split nuts, a polygonal head having the same shape as that of the lock nut is provided.

Fig. 1

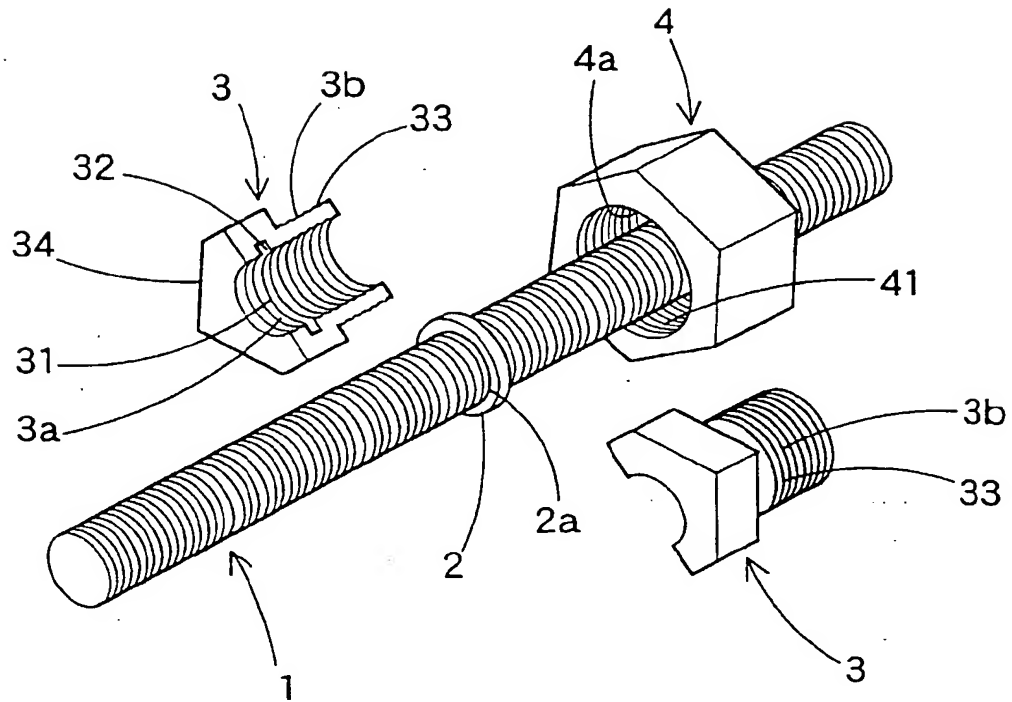


Fig. 2

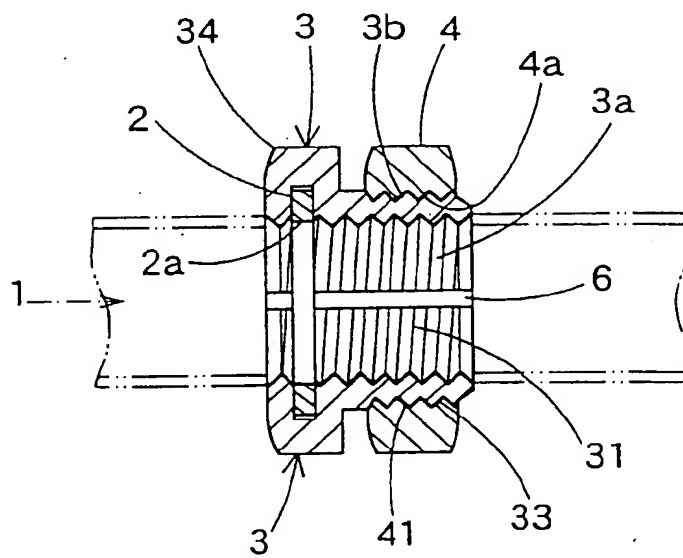


Fig. 3

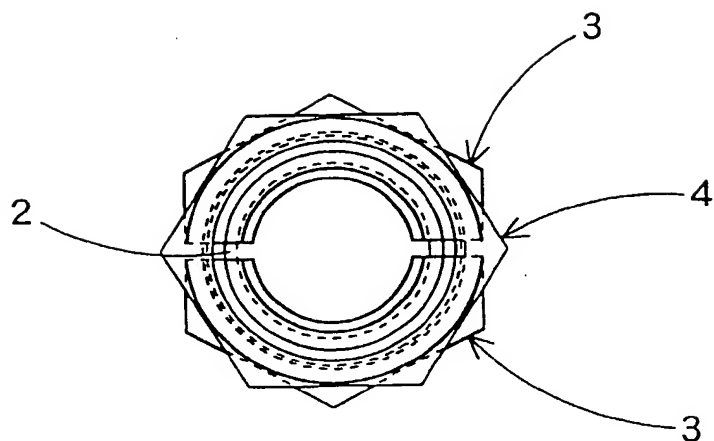
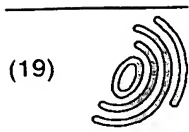


Fig. 4





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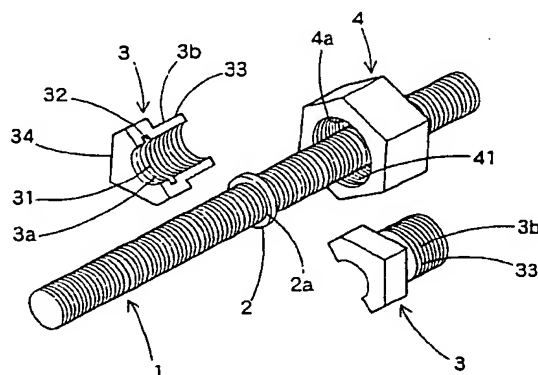
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still to a prescribed position. The split nuts (3,3) divided in two are fitted so as to envelope the outer circumference of the screw shaft and the nut setting member (2). The nut setting member is fitted into a locking groove (32) provided at the inner circumference of the split nuts (3,3), and the inner screw (3a,3a) of the split nuts (3,3) is fitted to the thread of the screw shaft. Thus the split nuts (3,3) divided in two are held in the assembled state in one body at a desired position of the outer circumferential part of the screw shaft by the fitting of the locking groove (32) at the inside and the nut setting member (2). In this state, the lock nut (4) is threadedly engaged with the outer circumferential part (3b) of the split nuts (3,3) and is tightened.

Fig. 1





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# EUROPEAN SEARCH REPORT

Application Number  
EP 98 30 5464

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO 87 07928 A (KOLVEREID) 30 December 1987 (1987-12-30) * page 2, line 4 - line 20; figures 1-4 *	1,4	F16B39/12 F16B35/02 F16B37/08
A	FR 907 211 A (JACQUOT) 6 March 1946 (1946-03-06) * page 1, line 13 - page 2, line 72; figures 1-11 *	1,4	
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A	GB 2 239 070 A (HAYES ET AL.) 19 June 1991 (1991-06-19) * page 3, line 13 - page 5, line 1; figures 1,2 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F16B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		5 October 1999	Calamida, G
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EPO FORM 1500 (01.82) (P4/C31)



**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82